

MAO et al.
Ser. No. 09/810,825
Page 2 of 11

Amendments to the claims:

1. (currently amended) An electrostatic comb drive comprising:
a base;
a movable element movably connected to the base and configured to move from a first stable position to a second stable position relative to the base;
a spring disposed between the base and the movable element and configured to provide a potential energy maximum between the first stable position and the second stable position;
a fixed finger attached to the base, the fixed finger having a first portion proximate to the base and disposed between the base and a second portion of the fixed finger; and
a movable finger attached to the movable element, the movable finger having a third portion proximate to the movable element and disposed between the movable element and a fourth portion of the movable finger, a first capacitance arising between the fixed finger and the movable finger when the second portion is adjacent to the fourth portion and a second capacitance arising between the fixed finger and the movable finger when the second portion is adjacent to the third portion, the first capacitance being greater than the second capacitance.
2. (original) The electrostatic comb drive of claim 1 wherein the second portion is wider than the first portion and the fourth portion is wider than the third portion.
3. (original) The electrostatic comb drive of claim 1 wherein the second portion is at least three times as wide as the first portion.
4. (original) The electrostatic comb drive of claim 1 wherein the first portion is less than four microns wide and the second portion is greater than six microns wide.
5. (currently amended) An electrostatic comb drive comprising:

MAO et al.
Ser. No. 09/810,825
Page 3 of 11

a base;

a movable element movably connected to the base and configured to move from a first position to a second position relative to the base;

a spring disposed between the base and the movable element and configured to provide a potential energy maximum between the first position and the second position;

a fixed finger attached to the base, the fixed finger having a first portion proximate to the base and disposed between the base and a second portion of the fixed finger; and

a movable finger attached to the movable element, the movable finger having a third portion proximate to the movable element and disposed between the movable element and a fourth portion of the movable finger, a first capacitance arising between the fixed finger and the movable finger when the second portion is adjacent to the fourth portion and a second capacitance arising between the fixed finger and the movable finger when the second portion is adjacent to the third portion, the first capacitance being greater than the second capacitance wherein the second portion is taller than the first portion and the fourth portion is taller than the third portion.

6. (previously amended) The electrostatic comb drive of claim 5 wherein the second portion is at least three times as tall as the first portion.

7. (currently amended) ~~The electrostatic comb drive of claim 1 further comprising~~ An electrostatic comb drive comprising:

a base;

a movable element movably connected to the base and configured to move from a first position to a second position relative to the base;

a spring disposed between the base and the movable element and configured to provide a potential energy maximum between the first position and the second position;

MAO et al.
Ser. No. 09/810,825
Page 4 of 11

a fixed finger attached to the base, the fixed finger having a first portion proximate to the base and disposed between the base and a second portion of the fixed finger;

a movable finger attached to the movable element, the movable finger having a third portion proximate to the movable element and disposed between the movable element and a fourth portion of the movable finger, a first capacitance arising between the fixed finger and the movable finger when the second portion is adjacent to the fourth portion and a second capacitance arising between the fixed finger and the movable finger when the second portion is adjacent to the third portion, the first capacitance being greater than the second capacitance; and

a mechanical latch to latch the movable element in one of the first position and the second position.

8. (previously amended) The electrostatic comb drive of claim 7 wherein the mechanical latch is combined with the spring to form a latching spring arm.

9. (currently amended) An electrostatic comb drive comprising:

a base;

a movable element movably connected to the base and configured to move from a first position to a second position relative to the base;

a spring disposed between the base and the movable element and configured to provide a potential energy maximum between the first position and the second position;

a first fixed finger attached to the base, the first fixed finger having a first portion proximate to the base and disposed between the base and a second portion of the first fixed finger; and

a first movable finger attached to the movable element, the first movable finger having a third portion proximate to the movable element and disposed between the movable element and a fourth portion of the first movable finger, a first capacitance arising between the first fixed finger and the first movable finger when the second portion

MAO et al.
Ser. No. 09/810,825
Page 5 of 11

is adjacent to the fourth portion and a second capacitance arising between the first fixed finger and the first movable finger when the second portion is adjacent to the third portion, the first capacitance being greater than the second capacitance;

a second movable finger attached to the movable element and extending away from the movable element in a direction opposite to the first movable finger; and

a second fixed finger proximate to the second movable finger and extending from the base toward the movable element, wherein the second movable finger is electrically coupled to the first movable finger and the second fixed finger is electrically coupled to the first fixed finger.

10. (currently amended) ~~The electrostatic comb drive of claim 1 further comprising~~ An electrostatic comb drive comprising:

a base;

a movable element movably connected to the base and configured to move from a first position to a second position relative to the base;

a spring disposed between the base and the movable element and configured to provide a potential energy maximum between the first position and the second position;

a fixed finger attached to the base, the fixed finger having a first portion proximate to the base and disposed between the base and a second portion of the fixed finger; and

a movable finger attached to the movable element, the movable finger having a third portion proximate to the movable element and disposed between the movable element and a fourth portion of the movable finger, a first capacitance arising between the fixed finger and the movable finger when the second portion is adjacent to the fourth portion and a second capacitance arising between the fixed finger and the movable finger when the second portion is adjacent to the third portion, the first capacitance being greater than the second capacitance; and

a voltage supply electrically coupled to the fixed finger with a first electrical connection and electrically coupled to the movable finger with a second electrical connection, the voltage supply configured to provide a first voltage pulse to toggle the

MAO et al.
Ser. No. 09/810,825
Page 6 of 11

movable element from the first position to the second position and to provide a second voltage pulse to toggle the movable element from the second position to the first position wherein the first voltage pulse and the second voltage pulse are essentially the same.

11. (previously amended) An electrostatic comb drive comprising:
a base;
a movable element movably connected to the base and configured to move from an initial position to a latched position relative to the base;
a fixed finger attached to the base, the fixed finger having a first narrow portion proximate to the base and a first wide portion distal from the base; and
a movable finger attached to the movable element, the movable finger having a second narrow portion proximate to the movable portion and a second wide portion distal from the movable element, the second wide portion being drawn in a first direction toward the first wide portion from the initial position toward the latched position when a first voltage pulse is applied between the fixed finger and the movable finger, and being drawn in a second direction toward the first wide portion from the latched position when a second voltage pulse is applied between the fixed finger and the movable finger, the first direction being opposite to the second direction.

12. (original) The electrostatic comb drive of claim 11 further comprising a latching spring arm.

13. (original) The electrostatic comb drive of claim 11 further comprising an overlap portion extending away from the first wide portion toward the movable element, the overlap portion being at least partially adjacent to the second wide portion in one of the first position and the second position.

14. (original) The electrostatic comb drive of claim 11 further comprising an overlap portion extending away from the second wide portion toward the base, the overlap portion being at least partially adjacent to the first wide portion in one of the first position and the second position.

MAO et al.
Ser. No. 09/810,825
Page 7 of 11

15. (original) The electrostatic comb drive of claim 11 wherein a center portion of the second wide portion has been removed.

16. (original) An electrostatic comb drive comprising:

a base;

a movable element;

a first latching spring arm movably connecting the movable element to the base;

a second latching spring arm movably connecting the movable element to the base, the first latching spring arm and the second latching spring providing a first potential energy minimum at a first stable position of the movable element relative to the base and providing a second potential energy minimum at a second stable position of the movable element relative to the base, and providing a potential energy maximum between the first stable position and the second stable position;

a fixed finger attached to the base, the fixed finger having a first narrow portion proximate to the base and a first wide portion distal from the base, the first wide portion being at least twice as wide as the first narrow portion; and

a movable finger attached to the movable element, the movable finger having a second narrow portion proximate to the movable portion and a second wide portion distal from the movable element, the second wide portion being at least twice as wide as the first narrow portion.

17. (canceled)

18. (canceled)

19. (currently amended) An electrostatic comb drive comprising:

a base;

a movable element configured to move from a first stable position to a second stable position relative to the base;

MAO et al.
Ser. No. 09/810,825
Page 8 of 11

a fixed finger attached to the base, the fixed finger having a first short portion proximate to the base and a first tall portion distal from the base; and

a movable finger attached to the movable element and opposed to the fixed finger, the movable finger having a second short portion proximate to the movable element and a second tall portion distal from the movable element so that the movable element is pulled toward the base when an electric potential is applied between the fixed finger and the movable finger.

20. (currently amended) ~~The electrostatic comb drive of claim 19~~ An electrostatic comb drive comprising:

a base;

a movable element configured to move from a first position to a second position relative to the base;

a fixed finger attached to the base, the fixed finger having a first short portion proximate to the base and a first tall portion distal from the base; and

a movable finger attached to the movable element and opposed to the fixed finger, the movable finger having a second short portion proximate to the movable element and a second tall portion distal from the movable element so that the movable element is pulled toward the base when an electric potential is applied between the fixed finger and the movable finger, wherein a portion of the first tall portion overlaps at least a portion of the second tall portion when the movable element is in a first stable position.

21. (previously amended) The electrostatic comb drive of claim 19 wherein the first tall portion is at least three times as high as the first short portion and the second tall portion is at least twice as high as the second short portion.

22-31. (canceled)